Winners and Losers of Marketplace Lending: Evidence from Borrower Credit Dynamics

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Consumer Lending in the United States

- Consumer lending constitutes significant share of U.S. economy
  - Accounts for $3.6 trillion as of 2017
- Banking intermediaries serve as primary providers of credit to most consumers
  - Specialize in screening and monitoring, and enjoy economies of scale in reducing information asymmetry (Diamond, 1984; Ramakrishnan and Thakor, 1984)
- Consumer lending market rife with inefficiencies
  - Over-reliance on crude, formulaic methods to determine creditworthiness
  - Significant informational frictions
  - High interest rates on loans, even for high credit quality applicants (Stango and Zinman, 2009)
  - Post-crisis capital requirements and regulatory restrictions further limiting credit access

Rise of FinTech in Consumer Credit Markets

- Banking inefficiencies creating entry avenues for innovators
  - Changes in consumer attitudes and technological improvements also possible contributors
- Marketplace lending (MPL) platforms specializing in peer-to-peer ("P2P") lending in the consumer credit market
- Reliant on online marketing and underwriting platforms
  - Traditional banks not involved in loan origination process
- Alternative loan pricing schemes

Features of MPL Platforms

- Process relies on matching individual borrowers to prospective investor-lenders
  - Information asymmetry reduced through credit-bureau generated borrower reports made available by MPL
  - Aids in possibly overcoming the principal-agent problem (Jensen and Meckling, 1976)
- Disbursed MPL funds are unsecured
  - MPL platform plays role of broker; lenders bear full risk of borrower defaults
- MPL loans used primarily for debt consolidation
  - Over 70% of loan applicants on MPL platforms in US state "expensive debt consolidation" as primary reason for requiring MPL funds (source: Prosper and Lending Club)
- No mechanism in place to ensure that borrowed MPL funds are used towards reasons stated on loan applications

Research Questions

- **Question 1**: Is stated aim of debt consolidation misreported on MPL loan applications?
  - MPLs lack enforcement mechanisms
- **Question 2**: Does borrowing from MPLs alter credit profile characteristics?
  - Default rates, credit card utilization, credit scores, etc.
- **Question 3**: Identify winners and losers of MPLs
  - Cross-sectional analysis
  - Identify mechanisms that determine benefits or costs imposed on MPL borrowers
  - Facilitated by cohort-level analysis comparing borrowers to non-borrowers

Preview of Findings

- Credit card balances decline 47% in the quarter of MPL loan origination, before reversing trend
- Average credit score jumps by approximately 19 points in the quarter of MPL loan origination
- Findings suggest that credit card limits increase in months following MPL loan origination, especially for subprime borrowers
- Credit card default rates spike, especially for subprime MPL borrowers
- Evidence suggests that bank lending actions are triggered by MPL-induced improvement in borrowers' credit scores

Related Literature

- Lending decisions within online platforms:
  - Freedman and Jin (2011), Lin et al. (2013), Iyer et al. (2015), Hildebrand et al. (2016)
- Determinants of interest rates on MPL loans:
  - Race and age (Pope and Sydnor, 2011); gender (Barasinska, 2011; Pope and Sydnor, 2011); beauty (Ravina, 2012); stereotypes (Hasan et al., 2018); non-verifiable disclosures (Michels, 2012); group leader bids (Hildebrand et al., 2016)
- Credit expansion vs. credit substitution?
  - Jagtiani and Lemieux (2017), Wolfe and Yoo (2018), Buchak et al. (2017)
- Impact of MPL credit on consumers:
  - Balyuk (2018), Demyanyk et al. (2017)
- Importance of credit scores in bank-lending relationships:
  - Keys et al. (2010), Rajan et al. (2015), Agarwal et al. (2018), Liberman et al. (2017)

Data Sources

- Credit bureau trades file:
  - Information on the various trades opened by an individual (auto, mortgage, student loans, bankcard, etc.)
  - Used to identify individuals who have borrowed through fintech lenders
- Credit bureau credit file:
  - Balance information at monthly frequency for various kinds of trade lines
  - Monthly utilization ratios
  - Monthly credit scores
- Demographic file:
  - Occupation
  - Education status
  - Income

MPL Borrowers v. Average U.S. Population

	MPL Borrowers	National	Homeowners
Panel A: Credit Characteristics			
# Open Trades	10.49	4.68	7.58
# Auto Trades	1.02	0.66	0.84
# Mortgage Trades	0.86	0.79	1.07
# Student Loan Trades	2.23	1.66	1.49
# Credit Card Trades	3.84	1.97	2.74
Vantage Score	656.44	675.47	733.84
Total Balance	$232,463	$208,195	$310,142
Auto Balance	$20,659	$17,038	$20,648
Mortgage Balance	$189,597	$186,237	$274,244
Student Loan Balance	$24,425	$19,122	$20,210
Credit Card Balance	$9,821	$4,197	$5,994
Credit Card Utilization	69.42%	30.89%	28.55%
Panel B: Income Characteristics			
Monthly Income	$3,602	$3,437	$5,232
Debt-to-Income	41.03%	27.82%	45.39%

Empirical Approach

- Examine how MPL loans change credit profiles of borrowers
- Utilize event study methodology similar to Agarwal et al. (2016), and Agarwal et al. (2017):

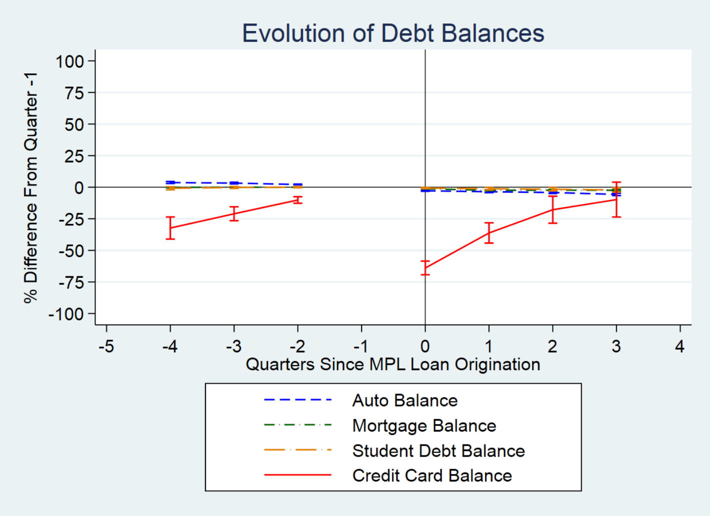
$$ln(Y_{i,t}) = \sum_{\tau \neq -1} \beta_\tau Quarter_{i,\tau} + \gamma \mathbf{X}_{i,t} + \alpha_i + \delta_t + \epsilon_{i,t} \quad (1)$$

- Definitions:
  - $Quarter_{-1}$ ($Quarter_{+1}$) refers to months [-3,-1] (months [+4,+6]) in relation to month of MPL loan origination
  - τ varies from -4 to +3, with $\tau = -1$ omitted
  - Individual- and year-quarter fixed effects
  - SEs double clustered at individual- and year-quarter levels
  - $\mathbf{X}_{i,t}$: Monthly income, educational attainment, occupation, and homeownership status

Question #1: What type of debt is consolidated?

- Possible strategic misreporting due to non-verifiable nature of reasons stated on MPL loan applications
  - Moreover, non-verifiable reasons affect loan pricing on MPL platforms (Michels, 2012)
- What kind of debt is consolidated?
  - Comparison of average interest rates:
    - Auto (4.21% on 60 month loans)
    - Mortgage (4.125% for 15-year FRM, 3.875% on 5/1 ARM)
    - Student loans (4.5–7%)
    - Credit cards (15–20%)
  - Inefficient consolidation can leave borrowers worse off

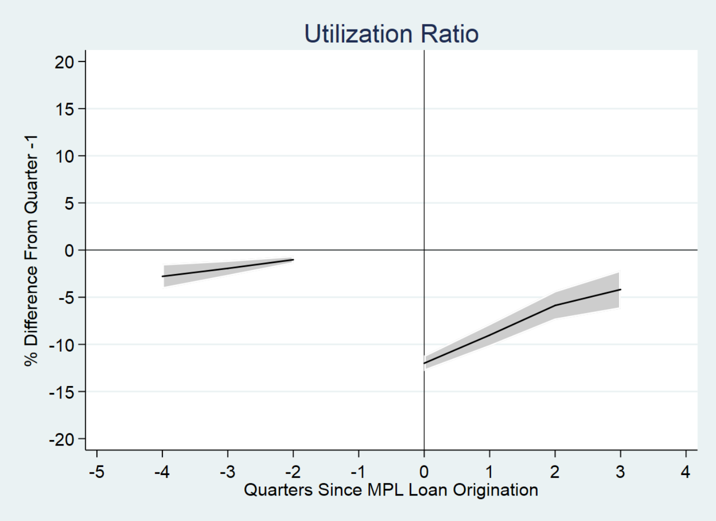
Evolution of Debt Balances



Question #2: Long-run effects on credit profile?

- Are other credit profile characteristics affected by MPL loan-induced credit card debt consolidation?
- How long do these credit profile changes persist?

Credit Card Utilization

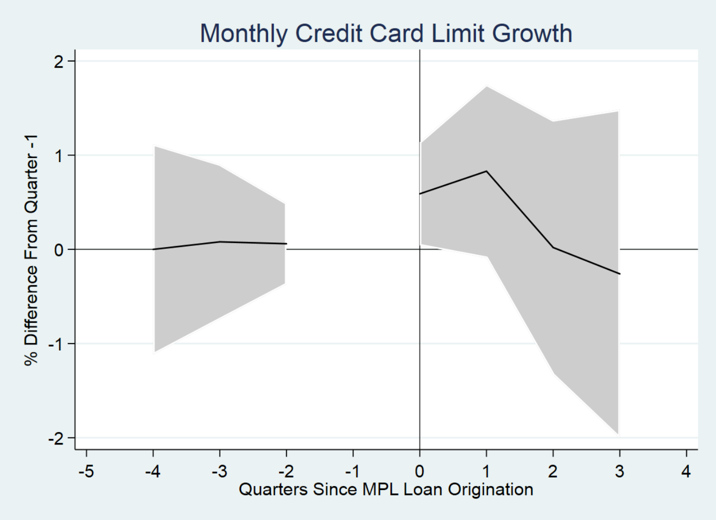


Determinants of Utilization

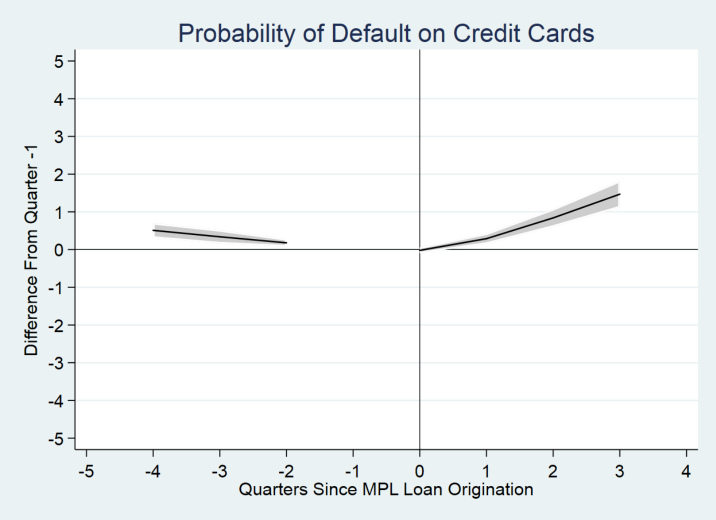
$$Utilization = \frac{Balance}{Limit}$$

- Our findings indicate that at the 1-year mark following MPL loan origination:
  - Balance $\approx$
  - Utilization $\downarrow$
  - Suggests that: Limits $\uparrow$

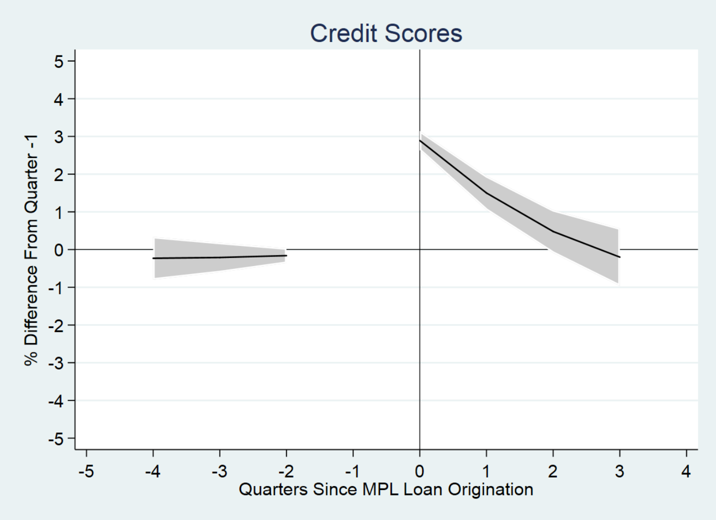
Δ(Monthly Credit Card Limits)



$\mathbb{P}$(Credit Card Default)



Credit Scores



Alternative Channels?

- Job/Income loss
  - Results cannot be explained by change in employment or income of the MPL borrower
- Regional economic factors
  - Pattern of findings not driven by region-specific shocks exogenous to the MPL borrowers
  - Robust to 5-digit ZIP $\times$ Year-Quarter fixed effects

Identification – Matched-Sample Analysis

- Creating cohorts of borrowers and non-borrowers:
  - Identify non-MPL borrowers from same 5-digit (or 9-digit) ZIP as MPL borrower
  - Identify subset of non-MPL borrowing neighbors with need for credit
  - Identify neighbors with identical ex-ante credit and income profile trends in calendar time
  - Use kNN algorithm to identify most similar neighbor to MPL borrower
- Successful in identifying cohorts of borrowers and neighbors with similiar dynamics in credit scores, utilization, debt balances, etc.
- Results robust to matched-sample analysis
- Lingering concerns of selection on observables

Identification – Natural Experiments

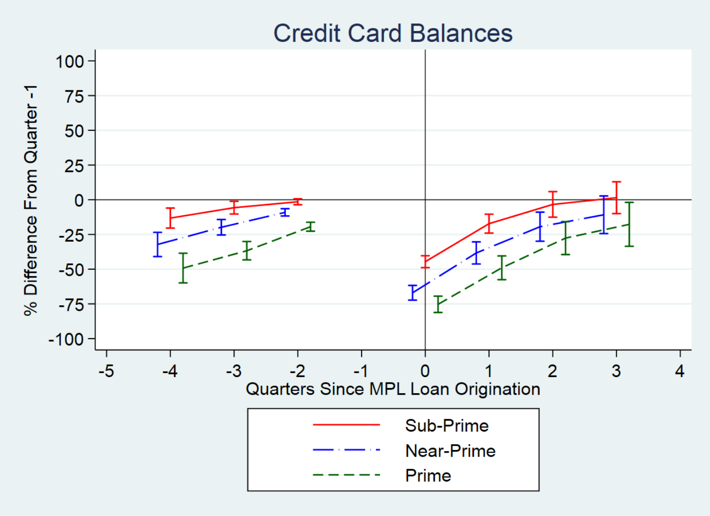
- Identifying ‘shocks’ to geographic regions that could affect MPL share:
  - Changes in broadband access
  - Rollout of Google Fiber (used in Fuster et al. (2018))
  - Bank branch closures
- Currently ongoing

Differential Patterns based on Credit Status

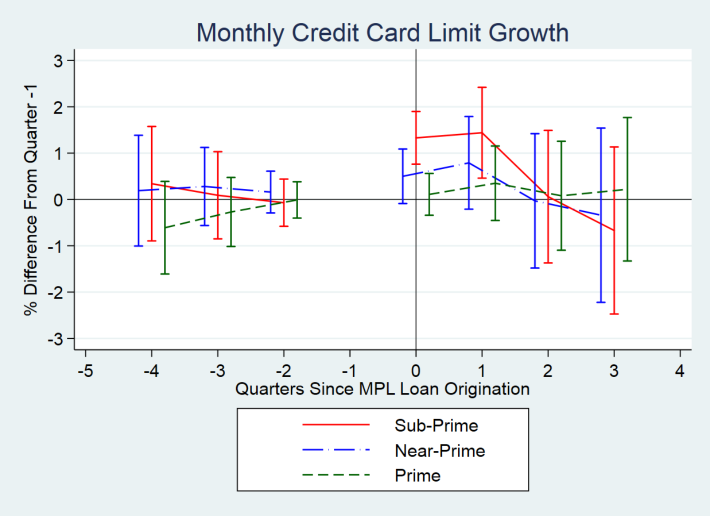
- Analysis thus far assumes that all MPL borrowers are of equal sophistication
- MPL borrowers differ on financial sophistication, however
- Sophistication proxied through credit score in the month prior to MPL loan origination:

Sophistication Level	Score Range Pre-MPL Origination	Percentage of Total Sample
Subprime	[300, 620)	23%
Near-Prime	[620, 680)	50%
Prime	[680, 850]	27%

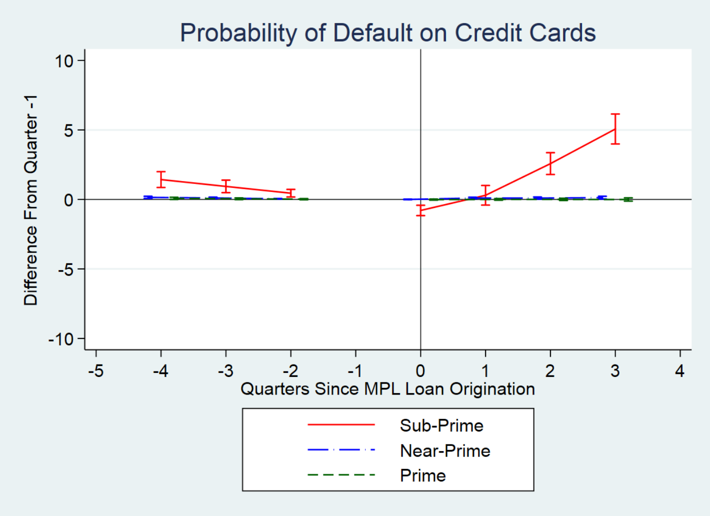
Credit Status Cuts – Credit Card Balances



Credit Status Cuts – Δ(Credit Card Limits)



Credit Status Cuts – $\mathbb{P}$(Credit Card Default)



Improvement in MPL Borrower Creditworthiness?

- Earlier findings suggest that MPL borrowers experience increase in average credit scores in quarter of MPL loan origination
  - Scores increase by 2.89% ($\approx$ 19 points) for entire sample
- Findings also show that MPL borrowers experience stronger credit card limit growth immediately following origination
- Are increases in credit card limits caused by MPL-induced improvement in credit scores?
  - Studied through cohort-level analysis

Empirical Specification

- Use kNN algorithm to match MPL borrowers to non-borrowing neighbors in same 5-digit (or 9-digit) ZIP with identical ex ante credit and income dynamics
- Specification relies on comparing borrowers to non-borrowers *within* cohort:

$$log\left(\frac{AvgScore_{[+1,+3]}}{AvgScore_{[-3,-1]}}\right) = MPL\_Borrower_{i,c} + \gamma\mathbf{X}_{i,c} + \alpha_c + \epsilon_{i,c} \tag{2}$$

- Instrumental variables setup:

$$log\left(\frac{AvgCCLimits_{[+1,+3]}}{AvgCCLimits_{[-3,-1]}}\right) = log\left(\frac{AvgScore_{[+1,+3]}}{AvgScore_{[-3,-1]}}\right) + \gamma\mathbf{X}_{i,c} + \alpha_c + \epsilon_{i,c} \tag{3}$$

Impact of MPL Loans on Subprime Borrower Creditworthiness

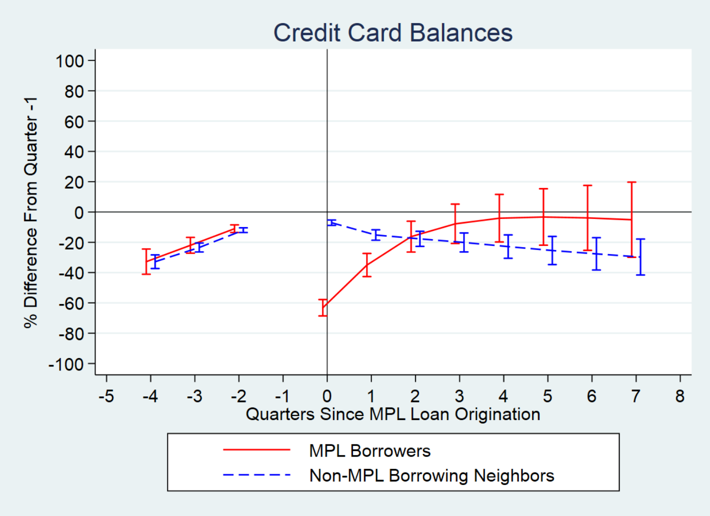
	1st Stage		IV	OLS
	Δ(Score)	$\mathbb{I}(Score_{post} >= 620)$	Δ(CC Limits)	Δ(CC Limits)
MPL Borrower	5.43***	34.80***		
	(0.09)	(0.27)		
Δ(Score)			0.89***	0.32***
			(0.05)	(0.03)
Observations	228051	228051	228051	228051
Adjusted R^2	0.16	0.17	0.01	0.03
Fixed Effects	C	C	C	C
Controls	✓	✓	✓	✓
F-Stat (Excl Instr.)			7140	

Near-Prime Cohorts

Conclusion

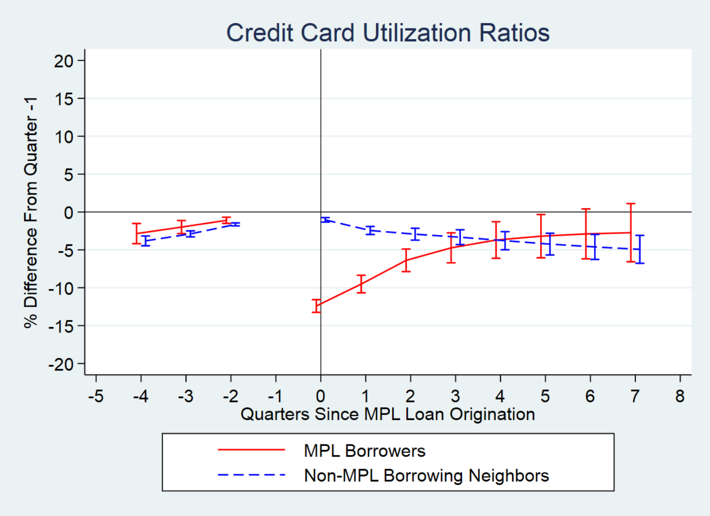
- Using credit bureau data, we analyze the credit profile evolution of borrowers on a major U.S. MPL
- Borrowers use funds to consolidate expensive credit card debt
  - Lowers credit utilization ratios, elevates credit scores
  - Consolidation phase is short-lived
  - Induces increased credit card limits from traditional banks
  - Significant increases in credit card default rates, especially for subprime MPL borrowers
- Results indicate that MPL-induced improvements in credit scores trigger bank lending actions
- Paper highlights how cascading of information between MPL platforms and banks through credit scores can leave some borrowers worse off

Matched Sample Comparison – Credit Card Balances



Tables: 5-Digit ZIP 9-Digit ZIP, Back: Back

Matched Sample Comparison – Credit Card Utilization



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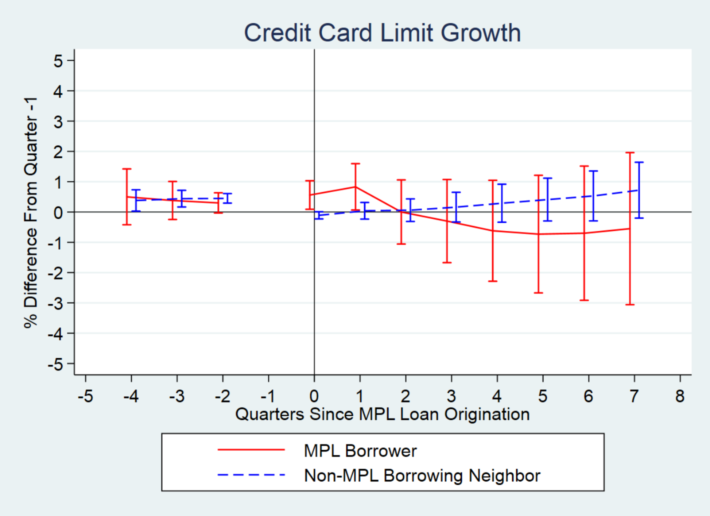
Matched Sample Comparison – Credit Card Limit Growth



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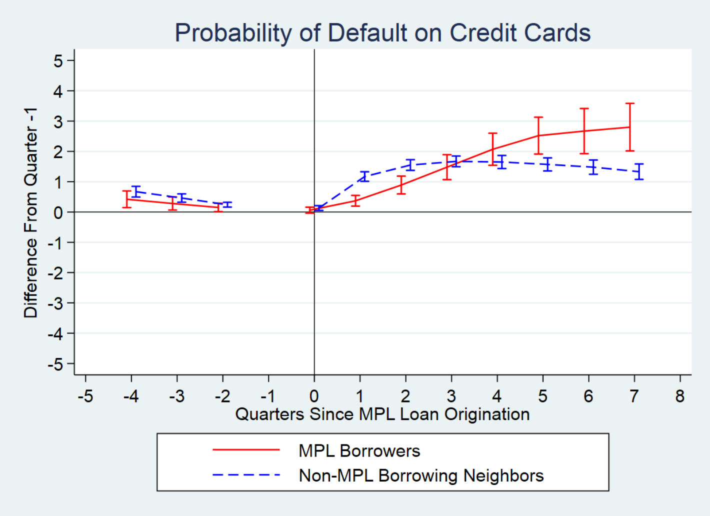
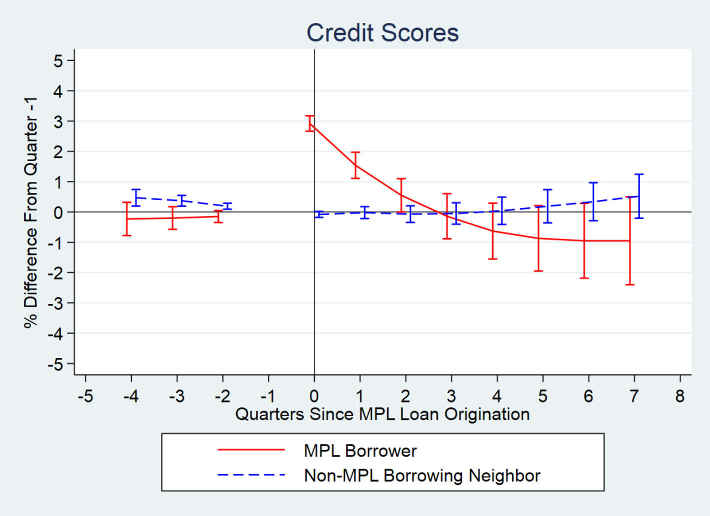
Matched Sample Comparison – $\mathbb{P}$(Credit Card Default)



Tables: 5-Digit ZIP 9-Digit ZIP , Back: Back

Matched Sample Comparison – Credit Scores



Tables: 5-Digit ZIP 9-Digit ZIP, Back: Back

Impact of MPL Loans on Near-Prime Borrower Creditworthiness

	1st Stage	IV	OLS	
	Δ(Score)	Δ(CC Limits)	Δ(CC Limits)	$\mathbb{I}(Score_{post} >= 680)$
MPL Borrower	4.25***			32.70***
	(0.04)			(0.31)
Δ(Score)		0.11***	0.05***	
		(0.01)	(0.02)	
Observations	523674	523674	523674	523674
Adjusted R^2	0.13	0.01	0.03	0.17
Fixed Effects	C	C	C	C
Controls	✓	✓	✓	✓
F-Stat (Excl Instr.)		11600		

Back